XXI.—*Observations on Early Nidification and Migration in North-west Ceylon.* By H. Parker, C.E., F.Z.S.

The district of Mannâr, in the north-west of Ceylon, consists chiefly of a somewhat triangular extent of low-lying plain, stretching north and south of the town of Mannâr. The coast-line forms the base (about 45 miles long) of the triangle, which is a very flat one, its apex being only about 13 miles from the coast. The district is hemmed in by almost impenetrable low forest, out of which several streams and rivers flow through the plain into the sea. Though often full in the wet season, they are all empty, with the exception of a few scattered pools, during the dry months.

The plain, and more especially its central portion, is studded with village reservoirs, or "tanks," which have extensive paddy-fields below them, the remaining ground being covered with a more or less dense growth of thorny jungle from 12 to 20 feet high. In all, there are some 130 of these tanks in the district. The fall of the land towards the sea is so slight that, although the depth of the tanks near the embankments is only from three to eight feet, the areas vary from 20 to 400 acres. The shallower parts of these sheets of water are filled during the wet season with tall sedge and weeds, the latter sometimes extending almost up to the embankments. In most cases lofty *kumbuk* trees (*Terminalia glabra*) line the embankments; and a few others, and occasionally thorny bushes, stand isolated or in groups in various parts of the water. When full, these tanks abound with fish and frogs, and are the resort, for food and nidification, of many thousands of water-birds.

Along the coast north of Mannâr, a flat unproductive strip of ground, utilized in ancient times for the formation of salt by solar evaporation of the sea-water with which it was flooded, is very little above sea-level; and, separating it from the sea, there runs a line of mudbanks covered with a growth of low trees and, in places, with mangroves. These trees are the breeding-quarters of large flocks of water-birds, and the permanent home of innumerable Parrakeets (*Palæornis tor-*

Rainfall of Mannâr, N.W. Ceylon.

	Jan. in.	Feb. in.	March. in.	April. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Total. in.
W. Province (mean of 4 stations)	4·63	3·44	8·09	11·86	16·18	13·96	8·26	6·08	9·93	14·47	14·64	7·59	119·13
S. Province (mean of 5 stations)	2·98	3·85	6·30	7·88	15·03	7·01	5·75	3·86	5·70	9·01	11·04	8·69	87·10
N.W. Province (mean of 4 stations)	1·96	1·85	4·70	5·89	6·10	3·55	1·57	1·59	2·82	8·26	11·49	5·53	55·31
E. Province (mean of 13 stations)	5·83	2·17	4·14	1·78	1·52	0·98	2·09	2·86	2·44	5·42	9·83	11·11	50·17
Mannâr (for 11 years)..	1·75	0·78	3·00	2·57	2·92	0·65	0·14	0·52	0·87	5·58	8·37	6·48	33·63

	N.E. Monsoon (October to March). in.	S.W. Monsoon (April to September). in.
Western Province	52·86	66·27
Southern Province	42·87	45·23
North-western Province	33·79	21·52
Eastern Province	38·50	11·67
Mannâr	25·96	7·67

quata), the ancient "salt-pans" being frequented by immense numbers of the true migratory Grallatores—Curlews, Plovers, Stints, Sandpipers, &c.

The rainfall, which is the smallest in Ceylon, is compared with that of stations not more than 500 feet above sea-level in other Provinces in the preceding Tables (p. 192).

With an annual evaporation of nearly 70 inches, the natural result of the very small south-west monsoon rainfall is the drying-up of almost all the tanks throughout the district, accompanied, of course, by the disappearance of all the aquatic weeds and plants that overran them, and the fish that filled them during the early months of the year.

These influences have led to a very decided alteration in the time of breeding of many of the birds, and have also necessitated their absence from the district during the dry season. The breeding-season of all those species more or less directly dependent on the food obtainable from the tanks, or the abundance of whose food is partially or indirectly dependent on the rainfall, or that seek the protection afforded by large sheets of water, takes place during the north-east monsoon. The birds which breed during that monsoon in the south of Ceylon breed much earlier at Mannâr, evidently in order to rear their young while food is plentiful. In illustration of this, the following Table shows the ascertained date of nesting of some species*:—

	SOUTH CEYLON.	MANNÂR.	REMARKS.
Haliastur indus	Feb., Mar.	Dec. to Feb.	Feeds on frogs, fish, and crabs in tanks.
Milvus govinda	....	Nov. to Jan.	" "
Ketupa ceylonensis	Feb. to Apr.	Jan., Feb.	" "
Palæornis torquata	Mar., Apr.	Jan., Feb.	Nests in trees surrounded by floods; later in other positions.
Alcedo bengalensis	Feb. to June.	Dec. *et seq.*	At the tanks; later at streams.
Malacocercus striatus	Mar. to July.	Jan. to Oct.	First brood chiefly in February.

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* The dates for "South Ceylon" are taken from Major Legge's excellent 'History of the Birds of Ceylon,' 1880.

	South Ceylon.	Mannâr.	Remarks.
Turtur suratensis ……	Mar. to June.	Jan. to July.	From January to March in partly submerged bushes; afterwards other sites.
Turtur risorius ………	….	Jan. to July.	„ „
Drymœca jerdoni ……	June, July.	Jan., Feb.	Insects most abundant in grass.
Drymœca valida………	….	Jan., Feb.	„ „
Drymœca inornata……	May, June.	Feb. to Apr.	In sedge and low thorns in tanks.
Ploceus philippinus ….	May to Aug.	Nov. to Feb.	Feeds in paddy-fields.
Munia punctulata ……	Apr. to July.	Jan., Feb.	Nests in partly submerged thorn-bushes in beds of tanks.
Munia malacca ………	May to Aug.	February.	„ „
Munia malabarica ……	….	Jan., Feb.	„ „
Acrocephalus stentorius .	June, July.	February.	In reeds in tanks.
Gallinula chloropus ….	….	Jan., Feb.	In partly submerged thorns.
Erythra phœnicura ….	May to July.	Jan., Feb.	„ „
Gallicrex cinerea ……	July, Aug.	(?) Feb., Mar.	In sedge and reeds.
Porphyrio poliocephalus .	….	February.	„
Dendrocygna javanica ..	June to Aug.	Feb. to Apr.	In partly submerged trees.
Sarcidiornis melanonotus	….	Jan. to (?) Mar.	
Ardeola grayi……….	May, June.	January.	In partly submerged thorn-trees.
Platalea leucorodia ….	March.	February.	„ „
Ibis melanocephalus ….	Jan., Feb.	Nov. to Feb.	„ „
Plegadis falcinellus ….	Jan., Feb.	Dec. or Jan.	(Young obtained.)
Herodias intermedia ….	Dec. to Apr.	Dec. to Feb.	In partly submerged trees.
Herodias garzetta ……	Dec. to Apr.	Dec. to Feb.	„ „
Nycticorax griseus……	March.	Jan., Feb.	„ „
Phalacrocorax pygmæus .	Jan. to Mar.	Dec., Jan.	„ „
Plotus melanogaster ….	Mar., Apr.	Feb., Mar.	„ „

After the breeding-season is over and the young birds are well able to provide for themselves, there is a general exodus in March or April of most of the Grallatores that are not true migrants, and of the Natatores, which reappear only after the beginning of the next north-east monsoon rains. (Small numbers of some species, however, remain throughout the year, obtaining a precarious living among pools in the beds of streams or the muddy dregs of the water in the tanks. A few also are permanent residents on the coast.) These *special* (as distinguished from the *true*) migrants are the following (and perhaps some others, regarding which there are doubts) :—

Gallinula chloropus.
Erythra phœnicura.
Gallicrex cinerea.
Porphyrio poliocephalus.
Hydrophasianus chirurgus.
Podiceps fluviatilis.
Sarcidiornis melanonotus.
Nettapus coromandelianus.
Dendrocygna javanica.
Platalea leucorodia.
Tantalus leucocephalus.
Anastomus oscitans.
Ibis melanocephalus.
Plegadis falcinellus.
(?) Xenorhynchus asiaticus.
Ardea cinerea.
Ardea purpurea.
Herodias alba.
Herodias intermedia.
Herodias garzetta.
Bubulcus coromandus.
Ardeola grayi.
Butorides javanica.
Nycticorax griseus.
Phalacrocorax pygmæus.
Plotus melanogaster.

The first to leave is the Moorhen (*Gallinula chloropus*), which disappears in March, the reason being not any want of food or climatic change, but manifestly the absence of the shelter or means of concealment that it apparently considers a necessity in Ceylon. Unlike the Waterhen (*Erythra phœnicura*), which for some time appears to feel at home in the jungle closely surrounding its former haunts, even after the water of the tanks has nearly evaporated, this bird completely abandons the district as soon as the low partly submerged thorn-bushes and the sedges which it frequents are left almost dry. The Blue Coot (*Porphyrio poliocephalus*), the Water-cock (*Gallicrex cinerea*), and the Bitterns are the next to follow. The other birds, being less partial to concealment, remain as long as a good supply of food is obtainable at no great risk ; but the majority disappear before the departure of the true migrants.

Such being the general facts observed, it remains to endeavour to account for them.

In every case the birds which nidificate at Mannâr at an earlier date than in other parts of Ceylon find a most abundant supply of food during their stay in the district—a supply that a few months later is entirely wanting. This, and the almost complete security experienced, and the suitability of their haunts for breeding-purposes, appear to me to be the only causes of the variation from the usual time of nesting.

The special migrations above mentioned may perhaps assist in explaining this little-understood habit in the case of many of the true migrants. In the first place, the Mannâr district has certainly not been the home of these special migrants from prehistoric times. Previous to the construction of the village tanks, all of which are artificial, there cannot have been any seasonal movement of this kind. There are almost no natural pools of fresh water; and such as are found are in the forest-tract surrounding the plain, and of small size and not frequented by these birds. The streams are intermittent and unsuitable. In the south-west monsoon they are never the resort of more than an insignificant number of some few of the larger Waders, and only a very few Cormorants feed in them during the wet season. It is quite certain, therefore, that the migration to Mannâr (and, in fact, to a considerable part of Ceylon, for the same reasons) has begun since the formation of the tanks; and the earliest date that can be fixed for the construction of any of them is about B.C. 450. There is every reason to believe that many in this district were made between that date and B.C. 100. The migration is therefore *to* Mannâr, and not *from* Mannâr; and hence it is also clear that the migrants formerly bred in their original homes, and have since been induced to change their habits in this respect. It seems to be proved, too, that a period of about 2000 years is enough to establish a migration. For instance, the migration of the Moorhen is fully established in this period; and, strange as the fact may appear, the annual visit takes place only to these tanks, the bird, which is plentiful here, having hitherto been procured but three times in other parts of Ceylon.

The migration to Ceylon must have been due, in the first instance, solely to the attraction of the food-supply. Stragglers of some of the species which feed in both fresh and salt water were no doubt accustomed to work down the coast; and when once the resources of the tanks were discovered, few years would elapse before a regular stream of migrants found its way to them annually. The flow is certainly not from other parts of Ceylon, but much more probably from Northern or Central India. Some peculiarities in the breeding-habits of *Ploceus philippinus* lead me to suppose that it may come from Western Ceylon; but no adequate diminution of the other species during the north-east monsoon (but rather an increase) has been observed in more southerly districts of the island.

Partial migrations.—In the admirable introduction to his 'History of the Birds of Ceylon,' Major Legge has already referred to a periodical absence of some species from the coast. This is observable throughout the Mannâr district; and in addition there is a departure, perhaps not quite *complete*, of *Coccystes jacobinus, Merops viridis,* and *Terpsiphone paradisi* (in the red plumage), the latter removing only from the immediate neighbourhood of the sea. The movement appears to be due, as Major Legge states, to the agency of the strong south-west winds, which blow with extreme violence in Mannâr. I surmise, however, that it is not caused by their direct influence on the birds themselves, but by their effect on the *food* of the birds, all of which, be it noted, are insectivorous. It is certain that insects cannot fly during strong winds without being carried away by them; and the result is that, in the littoral portion of the Mannâr district, few aerial insects are visible during the prevalence of the south-west breezes. Flies (which abound in countless insatiable hordes before the break of the monsoon), mosquitoes, and most beetles, moths, and butterflies alike disappear. In fact, in that tract the south-west monsoon is characterized by a general scarcity of winged insect life. Naturally, then, the first south-west winds are the signal for the inland movement of certain species of birds also. That the rains do not affect this partial migration is shown by its occurrence here, where often no rain, and never very much, falls at the heat of this monsoon or during its continuance.

The conclusions that would seem to follow from the facts thus observed are, therefore, as follows:—

1. That the time and place of nidification are determined by the food-supply and the feeling of security, and not by weather or climate.

2. That the cause of migration is the attraction of a plentiful food-supply.

3. That a period of 2000 years has sufficed for firmly establishing a migration.

4. That there are some exceptions to Mr. Seebohm's law that "every bird breeds in the coldest regions of its migrations" ('Siberia in Europe,' p. 244).

5. That the country in which a migratory bird breeds is not necessarily its original home.

XXII.—*On the Occurrence of* Charadrius virginicus *in Leadenhall Market, London.* By J. H. Gurney, Jun., F.Z.S.

On the 10th of November I bought, in Leadenhall Market, for the sum of fifteen pence, an American Golden Plover, *Charadrius virginicus*, a female by dissection, and apparently adult. The salesman was somewhat vague as to where it came from, first giving "Norway" as a locality, then "Holland." I should never like, from experience, to believe in any Leadenhall "locality" unless I actually saw the box, with the bird in it, unpacked; but that it was killed somewhere in Europe there can be very little doubt. On the 10th, and again a few days later, I looked to see if there were any American Grouse in the market, with which it might possibly have come over; but there were not any. The great similarity of this species to the Asiatic Golden Plover (*C. fulvus*), which is a somewhat smaller bird, has induced some ornithologists to think they are the same; but, in the opinion of Mr. H. E. Dresser, Mr. H. Seebohm, and other authorities, they are perfectly distinct. On comparing my example with a series of *C. fulvus* in the collection of Mr. Seebohm, they all proved to be smaller, while, on the other hand, the measurements, and the plumage also, in every respect, fitted exactly with a *C. virginicus* in Mr. Osbert Salvin's collection marked "female, Medellin, U. S. of Colombia," and quite sufficiently well with other specimens in the same collection. In 'The Ibis' for 1875 (p. 513) Mr. Dresser records, and